MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2015/2016

TIC3151 / TES3111 – ARTIFICIAL INTELLIGENCE

(All sections / Groups)

5th MARCH 2016
9.00 AM – 11.00 AM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 pages (including cover page) with 4 Questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

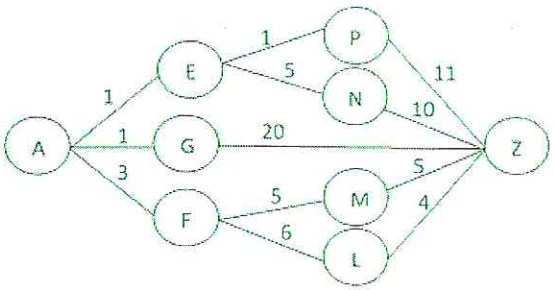
QUESTION 1

(a) Describe **ONE** intelligent feature of an existing IT device that is sold in current market. Identify the Artificial Intelligence branch (area) that is associated with that feature. [2 marks]

(b) Explain briefly the operations of a robotic vacuum cleaner if it is designed as :
(i) model-based reflex agent. [4 marks]
(ii) goal-based agent. [4 marks]

QUESTION 2

Given below is a map of cities with the distance between two cities represented in miles (mi). A table containing the heuristic values is also provided. Initial state is at City A. The goal is to arrive at City Z.



City	Heuristic value
A	20
E	6
G	19
F	5
L	9
M	7
N	7
P	12
Z	0

(a) How does the operation of Recursive Best-First Search (RBFS) differ from depth-first search (DFS)? [2 marks]

(b) State **ONE** limitation of Recursive Best-First Search (RBFS). [1 mark]

(c) Draw the search trees using RBFS. Show how the nodes within the search trees are visited and expanded step by step until it obtains a solution path. [6 marks]

(d) State the solution path and its path cost. [1 mark]

CONTINUED ...

QUESTION 3

(a) Suppose that you are given two empty containers, each with the ability to store 4 litres and 3 litres of water. You are also given access to a water source that allows you to fill the containers with water. Both containers have no measuring marks on them. You are supposed to measure exactly 2 litres of water in a container that can store 4 litres of water. The initial state and goal state are given below:

Initial state: Empty (4L-container) ^ Empty (3L-container)
Goal state: Balance (4L-container, 2)

Using STRIPS representation, list the sequence of actions that should be taken from initial state to the goal state. [4 marks]

(b) The data below shows the conditions for buying a car. The goal attribute is *Buy-Car*.

Income	Bus-Fare	Hybrid-Model	Review	Buy-Car
High	Free	Yes	Excellent	Definitely
High	Free	No	Excellent	Definitely
High	Moderate	No	Average	Definitely
Medium	Free	Yes	Excellent	Definitely
Medium	Moderate	No	Excellent	Definitely
Medium	Expensive	Yes	Excellent	Definitely
Medium	Expensive	No	Excellent	Definitely
Medium	Free	No	Excellent	No
Low	Moderate	Yes	Average	No
Low	Free	No	Average	No
Low	Expensive	Yes	Average	No
Low	Expensive	No	Excellent	No

Using the ID3 decision tree algorithm, the attribute *Income* has been identified as the root of the decision tree. Complete the decision tree, using the ID3 decision tree algorithm with *Income* as the root. Show your working step by step. [6 marks]

CONTINUED ...

QUESTION 4

(a) Given the following English sentences:

Ginger is a chicken. There is no chicken that has a raccoon as a buddy. Cluck is Ginger's buddy.

(i) Convert the English sentences above to first-order logic statements and Conjunctive Normal Form (CNF). [3 marks]

(ii) Based on the CNF defined in Question 4(a)(i), use resolution to show that *Cluck is not a raccoon.* [3 marks]

(b) Convert the following sentences into first-order logic statements. [4 marks]

(i) An item will drop if no glue is applied to it.

(ii) No girl likes every dress.

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